REPORT

SALVAGE OPERATION OF BEETLE INFESTED PINE TIMBER

LASSEN NATIONAL FOREST

CALIFORNIA

SUMMER, 1935

FOREWORD.

This beetle timber salvage project was the result of a cooperative agreement between the Forest Service and the Fruit Growers Supply Company. The Fruit Growers agreed to log all of the accessible, infested Government pine timber within one and one-half miles of their logging spurs on a free stumpage basis, and the Forest Service agreed to mark and supervise the logging of this timber as an insect control measure. This project also served as an experiment to see if this type of timber could be profitably logged.

PROJECT AREA.

The area on which salvage work was done comprises 6,010 net, spotted acres of virgin ponderosa and jeffery pine in Townships 32 and 33 North, Ranges 8 and 9 East, and is in the Bogard District of the Lassen National Forest. It was divided into three units: Ashurst, Burgess Springs, and Logan Springs, as shown on the attached maps.

It is situated in the Fruit Growers' timber sale area, and is bounded on the north by The Red River Lumber Company's holdings; on the east largely by open flats; on the south by old logging; and on the west by old logging and the Blacks Mountain Insect Control Project, carried on during the past winter of 1934 and 1935.

TIMBER TYPE AND SITE.

About 80% of the area is pure ponderosa pine. There is about a 40% mixture of jeffery pine with ponderosa pine on the remaining 20% of the area, which is confined to the higher elevations near Ashurst Mountain and Ashurst Lake.

The stand is Site III on the lower drainages and Site IV on the ridges.

PREVIOUS SALVAGE OR CONTROL WORK.

This was the first beetle control work on this particular area. No previous salvage work of any appreciable size has been undertaken before in California.

INSECTS INVOLVED.

The primary insects on these salvage units were: Dendroctonus brevicomis, Dendroctonus monticolae, Dendroctonus jefferyi, Ips emarginatus, Ips oregoni and Melanophila (species). Dendroctonus brevicomis was the most prevalent species, and probably did the most damage during the last or fall flight. The Bureau of Entomology made a very intensive stem analysis of about 250 of the first or over-wintering broods logged on this project. Their examinations showed the broods to be so heavily mixed with all of the above mentioned insects that one could not say that any one insect caused the greatest damage in that particular brood.

DURATION OF OPERATION.

The work began May 22, when a three man spotting crew began marking and mapping the infested timber. Falling of the trees started June 3, and the yarding started June 4. The project was completed October 11, when the last of the marked, infested timber was loaded.

SPOTTING.

Spotting began May 22 with a three man crew. The spotting crew was under the supervision of a junior forester, who worked as one of the crew until June 3, when the felling started. The spotting crew consisted of two men until July 1, when the spotting was terminated, with all but 1,210 acres of the final 6,010 net acres worked.

The junior forester spent about two thirds of his time picking up newly attacked trees, and trees that were missed by the spotting crew. These trees became more numerous as the season progressed, as there were new broods constantly emerging and attacking green trees. Thirty-two per cent of the trees logged were spotted in this manner.

When the logging crew covered the area originally spotted, two spotters of the Lassen Forest contributed three day's time and a new area of 1,210 net acres was spotted, which lasted the balance of the job.

MAPS REQUIRED.

Four maps of each section were required: a copy for the fallers, the scaler, the choker setters, and the junior forester.

FOREST SERVICE ORGANIZATION AND RATES OF PAY.

Personnel	Rate of Pay
One Junior Forester	$2000.00 per year
Two Field Assistants	125.00 per month

In addition Associate Forester Marc Edmonds of the Lassen worked 120 hours on the supervision of this project. Also Junior Forester Fred Bacon of the Lassen spent six days in spotting for this job.

FRUIT GROWERS' ORGANIZATION AND RATES OF PAY.

	Personnel	Rate of Pay
#	1 Watchman	$ 120.00 per month
	1 Timekeeper	135.00 " "
	1 Bull Buck and Scaler	160.00 " "
*	1 Conductor	130.00 " "
*	1 Locomotive Engineer	175.00 " "
	1 Choker Setter and Head Loader	160.00 " "
	1 Cat Mechanic and Driver	160.00 " "
*	1 Crane Engineer	.77 " hour
	1 Choker Setter and Hooker	.63½ " "
	4 Fallers	1.25 " M. B. M.
	1 (Bucker	.22 " "
	1 (Hooker	.63½ " hour
A	2 Track Maintenance Men	.50 " "

- 25 days charged against job.
* - Only the time that these men actually spent on loading, transporting logs, or repair of equipment was charged against this job.
A - About six weeks time charged against this project. None of the time of the woods superintendent was charged against this project, but in order to get a true logging cost, $1,250.00 was charged to

supervision in this report.

SUPERVISION.

The woods superintendent, A. E. Baker, was directly in charge of all phases of the logging.

The junior forester was in charge of the marking and mapping of the trees. He aided the choker setters in finding the trees, and passed judgment on whether cull trees should be sun cured from a control standpoint. He was also responsible for any unnecessary logging damage to the remainder of the stand.

TRANSPORTATION.

A large speeder was used by the Fruit Growers to haul the men to and from work.

FALLING.

There were two sets of fallers who felled, limbed, and bucked the tree off at a twelve inch top. They were paid a gypo rate of $1.25 per M. Bd. Ft., and paid on a Fruit Growers stump scale.

METHOD OF LOGGING.

The timber was logged in tree lengths to the landings, where it was bucked by hand and loaded on the flat cars on an average of every fourth day.

The timber was yarded in tree lengths with an eighty horse power, diesel Cletrac, equipped with a Carco Yarder. Considerable time was spent in bunching a load before starting to the landing. Usually from three to six trees were pulled to the track at a time, depending upon the size of the trees and the per cent of slope. If the topography permitted the trees were usually yarded to the nearest point on the railroad and scattered along the track. Many times, however, it paid to haul the trees to large openings along the track, where there was room to yard a quantity of timber together for loading.

The trees were bucked by hand into thirty-two foot log lengths as they lay along the track. One man was paid a gypo rate of twenty

cents per M. F. B. M. to do this bucking. He was also paid two cents per M. F. B. M. to do what limbing was necessary on these logs before loading them.

On large landings a bulldozer was used in shoving the logs to the track so that they could be reached by the loading crane, and also to make room for the yarding of more trees to that landing. The Fruit Growers had this machine idle and the superintendent or the cat skinner would seize odd slack periods during yarding or loading to "muck" the logs close to the track.

The logs were loaded on flat cars with an Ohio Crane. The crane was used in preference to a regular loading jammer because the logs were so scattered along the track that the crane could be more easily moved along the track to where the logs lay. On an average of every fourth day enough logs were yarded in for a day's loading. On loading days the yarding crew laid off and did the loading.

PEELING AND SUN CURING.

There were certain trees and logs that were entire culls and yet contained a heavy brood of beetles. The Fruit Growers agreed to either haul these cull logs to the mill or peel the bark from them and leave them in the woods. They found the latter method to be more economical so the junior forester passed judgment upon those cull trees which should be peeled from a control standpoint. The bull buck did most of this bark peeling work during his spare moments. The biggest part of the peeling was done on the landings and on individual logs, as usually the entire tree would not be a cull. There were a few trees, however, that were total culls and yet contained heavy broods of beetles, so these trees were peeled by the fallers and left in the woods.

SPECIES AND VOLUME SALVAGED.

Tree Species	No. of Trees	Vol. Bd. Ft.	Av. Volume
Ponderosa Pine	1,867	2,151,210	1,150 Bd.Ft.
Jeffrey Pine	397	505,280	1,530 " "
Totals	2,264	2,656,490	1,130 " "

Note: All Forest Service figures are based on a spotted volume of 2,656,490 board feet, and all Fruit Growers figures are based on 2,500-170 board feet scaled on landing by Fruit Growers.

SUMMARY OF VOLUME AND ACREAGES.

Total area covered	6,010 net acres
Number trees salvaged	2,264
Average volume per tree	1,130
Average number of trees per acre	.377
Average number of trees per section	239
Volume salvaged	2,656,490 board feet
Average volume per acre	442 " "
Number yarding days	83
Average volume yarded per day	32,000 " "
Average number trees yarded per day	27.27
Number loading days	22
Average volume loaded per loading day	120,750 board feet
Number of felling days per set	88
Average volume felled and limbed per set per day	12,768 " "

FOREST SERVICE DISTRIBUTION OF COSTS.

Pay Roll	$1,258.47
Travel and Expense	23.00
House Rent	64.47
Total Cost	$1,345.94

FOREST SERVICE UNIT COST.

Cost per M. F. B. M.	$ .52
Cost per tree salvaged	.59
Cost per acre covered	.22

COMPARATIVE COSTS OF SALVAGE OPERATION WITH THE TWO PREVIOUS CONTROL PROJECTS ON THE LASSEN.

Sale price on this area is now $4.50 per M F B M at that rate the following penalties total costs would be

	Summer 1935 Salvage	Winter 1934-35 Blacks Mt. Control Project	Winter 1933-34 Halls Flat Control Project
	$9.23	$10.52	$9.25
Cost per M. F. B. M.	$.52	$6.02	$4.75
Cost per tree	.59	6.21	4.56
Cost per acre covered	.22	1.61	.81

FRUIT GROWERS COMPARATIVE COSTS OF SALVAGE LOGGING DURING 1935 WITH REGULAR LOGGING DURING 1934.

Cost per M. F. B. M. for salvage operation..... $8.71 +52 = 9.23
Approximate cost per M. F. B. M. for regular logging (less stumpage and brush disposal costs)..... 9.07

Stumpage and brush disposal costs were not included as a matter of comparison for there was no stumpage on the bug timber and the Fruit Growers were not required to dispose of the brush.

SUMMARY OF FRUIT GROWERS LOGGING COSTS FOR BEETLE INFESTED TIMBER -- ANALYSIS OF COSTS.

Fall, Limb and Buck:

Number of falling days.....	92			
Number of man days.....	448½			
Wages.....		$3,427.13	1.37	
Supplies.....		137.25	.05	
Filing.....		65.41	.03	
Scaling and Bull Buck.....		671.52	.27	$4,301.31
			1.72	

Loading:

Number of days worked.....	22			
(Man days worked).....				
Landing crew and crane.....	113½			
Bulldozer.....	13½			
Train crew spotting.....	44½			
Total man days.....	171½			
Wages.....				
Landing crew and crane.....		$ 507.37	.20	
Bulldozer.....		45.70	.02	
Train crew spotting.....		254.00	.10	
Total wages.....			.32	$ 807.07
Supplies.....				
Landing crew.....		$ 151.67	.06	
Bulldozer.....		67.96	.03	
Train crew.....		344.00	.14	
Total supplies.....			.23	563.63
Limbing on landing.....				
Man days worked.....	11		.02	52.66
Carried forward.....				5,724.67

Brought forward.....				$ 5,724.67
Yarding.....				
Number of days worked.....	83			
Man days worked.....	275½			
Wages.....		$1,376.89		
Wages making rigging.....		99.57		
Total wages.....			.59	1,476.46
Supplies.....			.22	548.21
			.81	
Transportation:				
Main line haul - 20 miles.....				
Number of days worked.....	21			
Man days worked.....	88			
Wages.....		$ 508.36	.20	
Supplies.....		686.20	.27	
Total main line haul.....			.47	1,194.56
Spur haul - approximately 7 miles.....				
Number of days.....	22			
Man days worked.....	33½			
Wages.....		$ 193.30	.08	
Supplies.....		260.08	.10	
Total spur haul.....			.18	453.38
Repairs:				
Crane.....				
Wages.....		$ 74.73	.03	
Supplies.....		114.87	.05	
Total repairs.....			.08	189.60
Bulldozer.....				
Wages.....		$ 34.92	.01	
Supplies.....		13.37	.01	
Total repairs.....			.02	48.29
Yarding cats.....				
Wages.....		$ 130.02	.05	
Supplies.....		245.67	.10	
Total repairs.....			.15	375.69
Track Maintenance:				
Wages.....		$ 523.48	.21	
Supplies.....		768.90	.31	
Total.....			.52	1,292.38
Carried forward.....				$11,303.24

Brought forward.....		$11,303.24
Southern Pacific Freight (approximately 18 miles.....		2,574.00
Main line depreciation.....	$1,500.10	
Spur writeoff.....	2,331.00	
Total railroad write off.....		3,831.10
Logging Equipment Depreciation.....		2,200.00
Camp Expense.....		607.50
Supervision.....		1,250.00
GRAND TOTAL.....		$21,765.84

Total volume loaded..... 2,500,170 board feet
Cost per M. F. B. M..... ~~$8.71~~ $8.70

AGE OF BEETLE ATTACK IN TREES SALVAGED.

There were 1,745 trees that were marked in the original spotting, but as the logging progressed rather slowly, the broods had abandoned many of these original spotted trees before they were logged. There were 204 of these original spotted trees that were never cut, as they were small and the beetles had abandoned them. The following figures, while not precise, are the result of rather close examination of the majority of trees just before they were loaded on the cars.

Number original spotted trees.....	1,541
Original spotted trees with broods abandoned.....	616
Total original spotted trees containing broods.....	925
Newly attacked pickup trees containing full broods.....	723
Total brood trees salvaged.....	1,648
Total trees salvaged.....	2,264
Per cent of trees salvaged containing broods.....	73

At the time of logging a very intensive coverage of the infested trees was made, for as many of the new brood trees as could be detected by close spotting were picked up just ahead of the fallers. This was accomplished by getting the route of the fallers each day and making a very detailed examination of the trees within their route for that day. All these newly attacked trees were placed on the original spotting maps. The fallers were usually only three or four days ahead of the logging and the pickup work was only a day ahead of the fallers, so

that the elapsed time between the new spotting and the logging was only about five days.

This salvage job was probably about fifty per cent as effective as a control measure as a regular winter peeling and burning project, because the area was only logged over once, destroying one brood at the time of logging, but as there were two broods during the summer, one of them was not destroyed.

This statement is expression of opinion there is not yet available a sufficient basis for comparison

SALVAGE BENEFIT.

A lumber grade study of 104 of the first trees salvaged has been made by Dr. Brundage of the Experiment Station, but the results of this study have not been made available as yet.

There were, however, two different log studies conducted by Logging Engineer John Berry. The first study was in conjunction with Dr. K. A. Salmon, Associate Entomologist, and covered the same 104 trees of the above lumber grade study.

Following is a summary tabulation of these trees as taken from the first log study conducted by Mr. Berry:

Date of Attack	Species	No. of Trees	Gross Scale	Blue Stain Deduction	Blue Stain Per Cent
1934 Summer)	PP	17	3,297	1,360	41.4
Brood)	JP	8	1,295	464	35.8
Total.....		25	4,592	1,828	39.8
1934 Winter)	PP	34	3,775	1,536	40.7
Brood)	JP	35	3,948	1,255	31.8
Total.....		69	7,723	2,791	36.1
1935 Summer)	PP	6	1,197	128	10.7
Brood)	JP	4	420	61	14.5
Total.....		10	1,617	189	11.7

Decimal C Scale

Above table taken from a report of Logging Engineer John Berry on Lumbering Studies, Summer 1935

In order to try to determine the blue stain degree for which different age groups of the various beetle species were responsible, brood analysis was made by individual logs, and the following four stages of development were used:

A. Abandonment or complete emergence--snag trees.

B. Beetles in large larvae, pupae, and new adults--two to three weeks before complete emergence.

C. Beetles about one-half developed.

D. Beetles in parent adults, eggs, and small larvae--relatively recent attack.

The following table by Mr. Berry indicates the losses due to blue stain directly attributable to the above four stages of development for the four most important beetles found during this particular study:

Beetle Species	AGE CLASS OR STATE OF BEETLE DEVELOPMENT											
	A			B			C			D		
	No. Logs	Aver. Gross Scale	% of Blue Stain	No. Logs	Aver. Gross Scale	% of Blue Stain	No. Logs	Aver. Gross Scale	% of Blue Stain	No. Logs	Aver. Gross Scale	% of Blue Stain
D.B.	60	345	48.8	64	422	43.8	7	186	31.5	9	304	6.2
D.J.	2	593	65.9	11	514	52.4	5	494	23.5	5	416	10.6
I.E.	2	220	61.4	8	404	54.8	4	233	76.5	15	425	19.5
F.H.	3	537	34.2	22	218	47.5	16	256	0	5	130	0

Decimal C Scale.

Above table taken from a report on lumbering studies by Logging Engineer John Berry, Summer 1935.

It is noted that blue stain appears to develop faster after Dendroctonus jefferyi and Ips emargenatus than Dendroctonus brevicomis and the flathead species.

The following table is a summary for the entire mill scale study:

*	Group	No. Trees	No. Logs	Dec.C. Gross Scale	Blue Stain	% Blue Stain
Ponderosa Pine	A		79	3,203	1,487	46.4
Jeffery Pine	A		16	750	357	47.6
Total A			95	3,955	1,844	46.6

(Continued)	Group	No. Trees	No. Logs	Dec.C. Gross Scale	Blue Stain	% of Blue Stain
Ponderosa Pine	B	68	268	2,876	1,262	43.9
Jeffery Pine	B		69	2,879	1,187	52.1
Total B			137	5,155	2,449	47.5
Total A - B			232	9,108	4,293	47.1
Ponderosa Pine	C		23	709	236	33.2
Jeffery Pine	C		29	726	105	14.3
Total C			52	1,435	341	23.7
Ponderosa Pine	D		34	1,185	130	11.0
Jeffery Pine	D		20	621	44	7.1
Total D			54	1,806	174	9.6
		91				
Green logs in top killed trees		17	64	2,272	7	0
Green logs in other beetle trees		4	6	142	0	0
Trees with incomplete record		22	47	1,341	447	33.1
Total for Study		130	455	16,104	5,262	32.7

This study was made on the first timber that was salvaged. We were not certain at that time just what timber could be profitably salvaged, and many old trees and snags that later would not have been logged were taken in this study; consequently the per cent of blue stain is much higher in this study than the average run for the season.

The following is the result of a study of eighty-two logs, or 54,570 feet B. M. taken and presented by Mr. Berry in his last log study on September 6:

There were 22,340 F. B. M., or 40% of the volume, that contained practically no blue stain. These were all newly attached trees.

There were 11,510 F. B. M., or 21% of the volume, that contained 45% blue stain. The percentage of abandonment in these trees was rather high.

There were 12,080 F. B. M., or 22% of the volume, in logs that were completely abandoned, and contained 38% blue stain.

There were 8,640 F. B. M., or 16% of the volume, in logs completely abandoned and contained 46% of the volume in blue stain.

These results are still believed to be a little below the average quality of timber actually salvaged. The Fruit Growers estimated that 20% of the gross volume of all the material salvaged was in blue stain.

OBSERVATIONS AND RECOMMENDATIONS.

I. As this job served as an experiment as well as a salvage job, the following items in regard to merchantability were noted:

A. The logging of trees with abandoned broods or snags appears to be a poor salvage operation, as the timber is so badly blue stained and checked that the salvage benefits are probably of very little value.

B. The logging of timber with a high percentage of the brood abandoned is of doubtful benefit, either from the control or operating view points.

C. Generally only those trees should be salvaged that are certain of harboring the greater portion of their brood until they reach the mill.

D. Snags, if salvaged, should be selected as fairly free from blue stain, and probably only the clear portion or the first two or three logs taken from the woods.

II. In tree length logging the following advantages were noted when the timber was felled so that the chokers could be fastened to the butt of the tree:

A. Larger volume yarded per load.

B. Less damage to reproduction while yarding.

C. Less breakage while yarding.

III. Spotting should be done currently.

On a small salvage job like this one, a good method of handling the spotting, if there are available spotters on the Forest, would be to borrow these spotters often enough to keep the spotting ahead of the falling. A three man spotting crew in an infestation as heavy as on this job could mark enough timber in two or three days to last a logging crew similar to the one on this job two or three weeks. If this type of spotting were done the work could be confined to trees harboring

good broods.

IV. This type of beetle control could be as effective as the regular peeling and burning method provided:

A. The area treated was logged twice, or as many times as there are broods during the summer.

B. The area treated was logged while the broods are dormant or during the winter months.

We believe the salvage of beetle infested pine timber to be very good timber management, both from a control and a salvage point of view, and we hope that the results of this job might aid in future salvage projects.

Approved

P D Hanson
Forest Supervisor

Respectfully submitted,

Veldon A. Parker
Junior Forester

R.O.-
Salman.

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PHOTOGRAPHS TO GO WITH REPORT

ON SALVAGE OF BUG KILLED

TIMBER ON F.G.S.

CO. OPERATION.

M W Edmonds.

1. Shows type of logging equipment used in tree length logging. Cletrac diesel with Carco Fairlead Arch.

2. Same as # 1.

3 - Picking up load of insect attacked trees.

4 - The load on the way showing how a butt will "fan out" when the log is picked up by the top.

5 - A load on the way to landing properly picked up by the butts and making a very narrow trail.

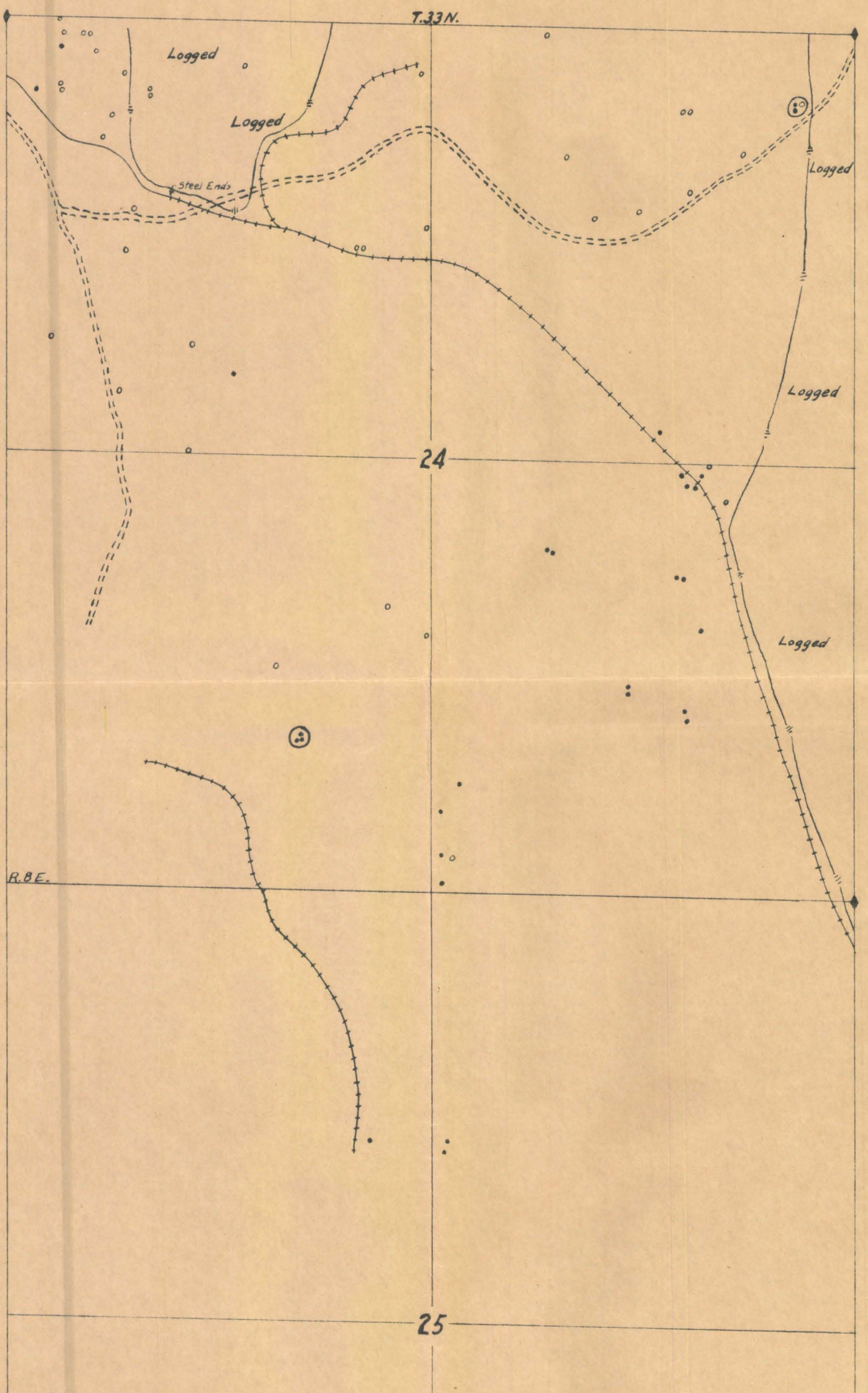
6 - Breaking a skid road through a pole stand.

7 - The most important duty of a "cat-boss" in tree length logging is picking out straigh skid roads with no side hill going and entailing as little destruction of young growth as possible.

8 - Dow power saw used in bucking trees at landing.

9 - Lifting the Dow saw over a bucked tree at landing. This is the principle difficulty with the saw. It is too heavy for two men to handle. The use of the saw was discontinued and trees were bucked by hand.

10 - Dow saw in operation. Actual sawing time was the smallest part of the job.



SALVAGE LOGGING OPERATION
OF
BEETLE INFECTED PINE TIMBER
BY
FRUIT GROWERS SUPPLY COMPANY
LASSEN NATIONAL FOREST
BURGESS SPRINGS UNIT SUMMER 1935

Scale — 8 Inches = 1 Mile

LEGEND

Ponderosa Pine	•
Jeffrey Pine	o
Railroad	
Secondary Road	

N
19°30'

INFESTATION
T.33N. R.8E.

	Section	Acres	No. Trees	Volume (bd. ft.)
	24	530	63	67,740
	25	50	3	6,420
Totals		580	66	74,160

Drawn By: V.A. Parker